Generalization of the Mixture Model Using a Copula Function

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In the mixture distribution model (for continuous and discrete cases), the density function, \( \hat{f}(t) \) is given by a linear combination of \( k \) density functions, \( f_i(t), \ i = 1, \ldots, k \), with non-negative weights \( p_i \) which must sum to 1.0. We propose a generalization of the mixture model where the weights are not restricted to being constant. The specification of the weight functions is not easy because \( \hat{f}(t) \) must be integrated to one. This is done by defining a random variable which has a density with the desired form. The definition of the random variable includes random variables with the densities \( f_i(t) \) and a copula function. The proposed model includes the traditional mixture model, the polyhazard and the fraction of cure models. Real applications are used to illustrate the model.

**Key Words:** Distribution functions, generalized probability distributions, multimodal hazard functions